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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Robert T. George

2207/12003

5090

25693

7590

12/04/2006

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EXAMINER

KIM, HONG CHONG

ART UNIT

PAPER NUMBER

2185

DATE MAILED: 12/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/940,324	GEORGE ET AL.	
	Examiner	Art Unit	
	Hong C. Kim	2185	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 8/27/01 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-17 are presented for examination. This office action is in response to the amendment filed on 11/22/06.

2. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The title should be more specific to differentiate the invention from similar inventions in the patent literature. The "client ports" aspect of the invention should be mentioned in the title so that the title is more descriptive.

Drawings

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "client ports" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an

amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Information Disclosure Statement

5. Applicants are reminded of the duty to disclose information under 37 CFR 1.56.

Claim Objections

6. Claims 9-16 are objected to because of the following informalities: As to claim 9 in line 3, it appears that "said plurality" should be changed to —a plurality—to avoid antecedent basis. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-4, 6-12, and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Sharma US patent No. 6,629,213.

As to claim 1, Sharma discloses a cache-coherent I/O device (Fig. 1) comprising: a plurality of client ports (Fig. 1 each I/O device Ref.122 to each Ref. 120), each to be coupled to one of a plurality of port components (Fig. 1 Refs. 122); a plurality of sub-unit caches (Fig. 1 Refs. 118), each coupled to one of said plurality of client ports and assigned to one of said plurality of port components; and a coherency engine (col. 1 lines 16-18 and Fig. 1 Ref. 108 and Fig. 2 Refs. 150) coupled to said plurality of sub-unit.

As to claim 2, Sharma discloses the invention as claimed in the above. Sharma further discloses wherein said plurality of port components includes processor port components (Fig. 1 Refs. 122).

As to claim 3, Sharma discloses the invention as claimed in the above. Sharma further discloses wherein said plurality of port components includes input/output components (Fig. 1 Refs. 122).

As to claim 4, Sharma discloses the invention as claimed in the above. Sharma further discloses wherein said plurality of sub-unit caches includes transaction buffers using a coherency logic protocol (col. 1 lines 16-18 and Fig. 1 Ref. 108 and Fig. 2 Refs. 150 and 168).

As to claim 6, Sharma discloses a processing system comprising (Fig. 1): a processor (Fig. 1 Ref 118); a plurality of port components (Fig. 1 Refs. 122); and a cache-coherent I/O device (Fig. 1 Refs. 122) coupled to said processor and including a plurality of client ports (Fig. 1 each I/O device Ref.122 to each Ref. 120), each coupled to one of said plurality of port components, said cache-coherent device further including a plurality of caches (Fig. 1 Refs. 118), each coupled to one of said plurality of client ports and assigned to one of said plurality of port components, and a coherency engine (col. 1 lines 16-18 and Fig. 1 Ref. 108 and Fig. 2 Refs. 150) coupled to said plurality of caches.

As to claim 7, Sharma discloses the invention as claimed in the above. Sharma further discloses wherein said plurality of port components includes processor port components (Fig. 1 Refs. 122).

As to claim 8, Sharma discloses the invention as claimed in the above. Sharma further discloses wherein said plurality of port components includes input/output components (Fig. 1 Refs. 122).

As to claim 9, Sharma discloses the invention as claimed. Sharma discloses a method comprises receiving a transaction request (col. 1 lines 14-15) at one of said plurality of client ports (Fig. 1 each I/O device Ref.122 to each Ref. 120) on the I/O cache-coherent device (Fig. 1), said transaction request includes an address (Fig. 2 ref. 156); and determining whether said address is present (col. 5 lines 47-52) in a plurality of sub unit-caches (Fig. 1 Refs. 118), each of said sub-unit caches assigned to said one of said plurality of client ports.

As to claim 10, Sharma discloses the invention as claimed in the above. Sharma further discloses wherein said transaction request is a read transaction request (col. 4 lines 59-61).

As to claim 11, Sharma discloses the invention as claimed in the above. Sharma further discloses transmitting data for said read transaction request from said one of said plurality of sub-unit caches to one of said plurality of client ports (col. 4 lines 59-66).

As to claim 12, Sharma discloses the invention as claimed in the above. Sharma further discloses prefetching one or more cache lines ahead of said read transaction request (cache memory reads on this limitation since the cache memory is used to assure that the currently useful data of main memory are copied into the small

and fast cache for the purpose of increasing data access speed by means of spatial and temporal localities); and updating the coherency state (Col. 4 lines 5-42) information in said plurality of sub-unit caches.

As to claim 14, Sharma discloses the invention as claimed in the above.

Sharma further discloses wherein said transaction request is a write transaction request (col. 6 lines 51-62).

8. Claims 5, 13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharma US patent No. 6,629,213 in view of Jim Handy, "The Cache Memory Handbook" TK7895.M4H35, 1993, pp 140-240.

As to claims 5 and 13, Sharma discloses the invention as claimed above.

Although Sharma discloses a cache coherency protocol (col. 4 lines 3-40), however, Sharma does not specifically disclose wherein said coherency logic protocol includes a Modified-Exclusive-Shared-Invalid (MESI) cache coherency protocol.

However, it is well known in the cache art to using MESI cache coherency protocol for the purpose of maintaining data consistency thereby increasing the memory access speed. For example, Handy discloses many different coherency logic protocols includes a Modified-Exclusive-Shared-Invalid (MESI) cache coherency protocol (Page 159).

Accordingly, it would have been obvious to one having ordinary skill in the art at the time the invention was made to add coherency logic protocol includes a Modified-

Exclusive-Shared-Invalid (MESI) cache coherency protocol of Handy into the invention of Sharma for the advantages stated above.

As to claim 15, Sharma and Handy disclose the invention as claimed in the above. Handy further discloses modifying coherency state information for a cache line in said one of said plurality of sub-unit caches; updating coherency state information in others of said plurality of sub-unit caches by said coherency engine; and transmitting data for said write transaction request from said one of said plurality of sub-unit caches to memory (MESI protocol reads on this limitation and pages 159-161).

9. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharma US patent No. 6,629,213 in view of Jim Handy, "The Cache Memory Handbook" TK7895.M4H35, 1993, pp 140-240 and further in view of Witt et al. (Witt) U.S. Patent 6,202,139.

As to claim 16, Sharma further discloses modifying coherency state information of said write transaction request (col. 7 line 13-15), however, neither Sharma nor Handy specifically discloses write transaction request in the order received and pipelining multiple write requests.

Witt discloses write transaction request in the order received and pipelining multiple write requests (col. 2 lines 42-43) for the purpose of avoiding bank conflicts thereby decreasing the performance losses and increasing the access speed (col. 2 lines 43-45).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate write transaction request in the order received and pipelining multiple write requests as shown in Witt into the combined invention of Sharma, Rhodes, and Handy because it would avoid bank conflicts thereby decreasing the performance losses and increasing the access speed.

As to claim 17, Sharma, Handy and Witt disclose the invention as claimed in the above. Handy further discloses wherein the coherency state information includes a Modified-Exclusive-Shared-Invalid (MESI) cache coherency protocol (Page 159).

Response to Arguments

10. Applicant's arguments with respect to claims 1-17 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

1. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See attached PTO-892.
2. A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) days from the mail date of this letter. Failure to respond within the

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period for response will result in **ABANDONMENT** of the application (see 35 USC 133, MPEP 710.02, 710.02(b)).

3. When responding to the office action, Applicant is advised to clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. He or she must also show how the amendments avoid such references or objections. See 37 C.F.R. ' 1.111(c).

4. When responding to the office action, Applicants are advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist examiner to locate the appropriate paragraphs.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hong C Kim whose telephone number is (571) 272-4181. The examiner can normally be reached on M-F 9:00 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah can be reached on (571) 272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 whose telephone number is (571) 272-2100.

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6. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

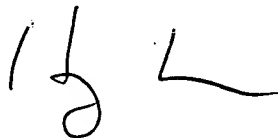
7. **Any response to this action should be mailed to:**

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

or faxed to TC-2100:
(571)-273-8300

Hand-delivered responses should be brought to the Customer Service Window (Randolph Building, 401 Dulany Street, Alexandria, VA 22314).

HK
Primary Patent Examiner
November 29, 2006

A handwritten signature in black ink, consisting of a stylized 'H' followed by a loop and a horizontal line.